



Hemodynamic Picture After Spinal Anesthesia Sectio Caesarea

journal home page: <https://goicare.web.id/index.php/JNJ>

Fredy Marta¹, Danang Tri Yudono¹, Septian Mixrova Sebayang¹, Made Suandika¹

¹Anesthesiology Nursing Study Program Applied Undergraduate Program,
Faculty of Health Harapan Bangsa University



CROSS-SECTIONAL STUDY

ARTICLE HISTORY

Received: September 11, 2024

Revised: October 28, 2024

Accepted: February 9, 2025

DOI: 10.61716/jnj.v3i1.95

*Corresponding author:

Fredy Marta

Anesthesiology Nursing Study Program
Undergraduate Program Faculty of
Health Harapan Bangsa University,
Indonesia Jl. Raden Patah No.100,
Ledug, Kembaran, Purwokerto,
Banyumas, Central Java, Indonesia.

Email: fredyj2prime@gmail.com



Abstract

Background: Sectio caesarea is a surgical procedure through an abdominal and uterine wall incision to remove the fetus, placenta and amniotic fluid. SC action with spinal anesthesia has an impact on body hemodynamics, such as changes in blood pressure, changes in pulse rate and changes in MAP. **Purpose:** The purpose of this research is to document the vital signs of patients undergoing post-spinal anesthesia for sectio secaria surgery at Sriwijaya Hospital Palembang. **Methods:** Research of this kind is known as descriptive research. This research used a purposeful sampling strategy to select 93 individuals who had spinal anesthesia for a caesarean delivery. **Results:** The frequency and percentages of blood pressure, pulse, and MAP of pregnant women having spinal acupuncture with anesthesia were determined by univariate data analysis. The majority of the 93 participants who had spinal anesthesia for caesarean section surgery had hypertension (60.2% of the total), asthma (72%) in 67 participants, systolic blood pressure below 90 mmHg in 45 participants (48.38%), and diastolic blood pressure below 60 mmHg in 46.2%. There were 52 cases of tachycardia (55.9% of the total), 33 cases of abnormal heartbeats (35.5% of the total), and 8 cases of bradycardias (8.6% of the total). In terms of population, 80 individuals (86.02%) reported normal levels, whereas 13 (13.98%) reported high levels. **Conclusion:** The majority of participants who had spinal anesthesia for section caesarian surgery reported abnormal MAP readings, pulse tachycardia, and hypotension.

Keywords: hemodynamics; intraoperative; section-caesarean; spinal anesthesia

Introduction

A surgical operation called a caesarean section (SC) involves making an incision in the uterine wall and abdominal wall to remove the amniotic fluid, placenta, and baby. In medicine, there are two types of causes requiring surgery: those involving the mother and those involving the fetus. Pregnancy complications may arise from a variety of fetal causes, such as an abnormally large baby, fetal discomfort, placental issues, anomalies in the umbilical cord, or the presence of twins [1,2]. Age, the number of children born to the mother, anomalies in the birth canal, abnormalities

in the contractions during delivery, KPD, preeclampsia, and other variables all fall under the category of maternal factors [3].

In an attempt to save the lives of women and babies, the World Health Organization (WHO) advised a range of 10% -15% for cesarean births in 1985. However, the rate of cesarean delivery has grown and now exceeds this recommendation. China saw a 46% rise in caesarean section occurrence between 2016 and 2021, whereas Asia, Europe, and Latin America each had a 25% increase [4]. The Basic Health Research (Riskesdas) 2019 data reveals that 17.6% of births in

Indonesia include a caesarean section, with a peak of 31.3% in the Jakarta region and a trough of 6.7% in Papua [5].

The sectoral caesarean birth rate is 20% for public or private hospitals in Indonesia, and 15% for private hospitals, according to the country's Ministry of Health. Nonetheless, the actual rate of cesarean deliveries is far higher than the government-mandated rate [6]. Mothers' fears about giving birth in pain, their inability to endure the pain of spontaneous labor, their inability to push, traumatic experiences during previous pregnancies, the belief that the time and date of their children's births determine their future, and the potential harm to their sexual relationships during a vaginal delivery all contribute to the rising trend of cesarean sections [7].

Rapid drug action, deeper sensory and motor blocking, uncomplicated procedures, minimum affect on the infant, and a modest risk of anesthetic drug toxicity are some of the numerous benefits of spinal anesthesia, which is used during sectional caesarean surgery [8–10]. Spinal anesthesia during surgery is associated with a number of risks that must be taken into account, one of which is the possibility of haemodynamic abnormalities in the mother's body [11,12]. Spinal anesthesia causes haemodynamic changes in the cardiovascular system, including changes to blood pressure, which are the result of a decrease in systemic vascular resistance and the body's response of increased cardiac output [13].

Aortocaval suppression in pregnant women can cause major changes in cardiac output in the form of a decrease in the amount of cardiac output. However, the effect of aortocaval suppression does not necessarily cause blood pressure because there is still a compensatory mechanism in the form of increased vascular tone. Induction of spinal anesthesia will reduce

peripheral vascular tone and increase the risk of hypotension in pregnant women due to the large changes in the amount of cardiac output due to aortocaval suppression, so that more severe hypotension occurs and requires management with vasopressors and fluid loading to maintain mean arterial blood pressure [14].

A decrease in blood pressure after spinal anesthesia is considered a physiological response [15,16]. Hypotension due to spinal anesthesia can be defined as a condition where there is a decrease in systolic blood pressure $>10.30\%$ in the first 30 minutes after induction of spinal anesthesia, or a decrease in mean arterial blood pressure of more than 30% within 10 minutes after the action, or a condition where there is a decrease in blood pressure until fluid or vasopressor intervention is needed within 20 minutes after spinal anesthesia or absolute systolic pressure reaches 90-100 mmHg or a decrease in blood pressure of 25-30% of preanesthetic blood right [17].

Hypotension during spinal anesthesia can be classified into two categories: tachycardia-related hypotension and bradycardia-related hypotension. Anesthesiologists agree that 63% of cases are related to tachycardia and 36% are related to bradycardia. More than 60% of anesthesiologists use ephedrine as a vasopressor to manage hypotension during spinal anesthesia most others use phenylephrine or with fluid therapy and changes in patient position (9). In haemodynamic changes, in addition to hypotension and pulse frequency, mean arterial pressure also occurs [18,19]. Mean arterial pressure is the blood pressure between systolic and diastolic, because diastolic lasts longer than systolic, mean arterial pressure is equivalent to 40% of systolic pressure plus 60% of diastolic pressure. Mean arterial pressure < 70

mmHg can be categorized as a hypotensive condition [20].

The use of spinal techniques in patients undergoing cesarean section can affect haemodynamic changes, namely a decrease in systolic pressure, diastolic pressure, and mean arterial pressure, and an increase in pulse frequency. This can cause serious complications, namely hypotension [21]. Suhartono, et, al (2019), in his research showed that there were changes in haemodynamics in patients after spinal anesthesia sectio caesarea at Merauke Hospital. Hypotension caused by haemodynamics can also have a direct effect on the baby. The uteroplacental system has no autoregulation, because the placental blood vessels are fully dilated. Uteroplacental perfusion depends only on the blood pressure of the pregnant mother. The lowest blood pressure limit that can still be compensated to ensure good human uteroplacental perfusion has yet to be determined [22].

Immediate recognition and treatment of a large drop in maternal blood pressure is crucial to protect both the mother and the baby from harm. Low blood pressure reduces APGAR scores. Infant acidosis may be minimized and neurobehavioral consequences are unaffected by brief hypotension (no more than two minutes) (12).

The results of data from Sriwijaya Hospital Palembang in 2023 cesarean section surgery reached 1050, approximately 40% of cesarean section surgery patients experienced intraoperative haemodynamic disorders (Ponek 2023 Sriwijaya Hospital Palembang). The administration of anesthesia in Sriwijaya Hospital Palembang 98% is done with spinal anesthesia, because general anesthesia (general) tends to result in a more unstable haemodynamic status that will interfere with the course of the operation, besides that general anesthesia

can extend the recovery period, longer treatment. From the observation of preliminary data in 2024, it is known that out of 162 pregnant women who performed Caesarean section surgery with spinal anesthesia there were 62 people who experienced haemodynamics, 47 of whom experienced hypotension during intraoperative, 15 people experienced hypertension. 46 people experienced bradycardia, 3 people were normal, and 13 people experienced tachycardia, 47 of them with normal MAP and 15 people with high normal MAP.

Therefore, the author is interested in conducting research with the title "Overview of Haemodynamic Changes After Spinal Anesthesia Sectio Caesarea with at Sriwijaya Hospital Palembang".

Methods

Research of this kind is known as descriptive research. A total of ninety-three individuals who had spinal anesthesia for a caesarean section operation were included in the study's sample. The frequency and percentage of blood pressure, pulse, and MAP of pregnant women having spinal acupuncture with anesthesia were determined by univariate data analysis. At Sriwijaya Hospital Palembang, the study was carried out. The study was place from July 5th to the 8th, 2024. The University of California, Berkeley's Research Ethics Committee gave its stamp of approval to this study (B.L.PPM-UHB/858/08/2024).

Result

Respondent Characteristics

Table 1. Summary of Respondent Characteristics Based on Frequency Distribution: Patients With Sectio Secaria Surgery With Spinal Anesthesia at Sriwijaya Hospital Palembang in 2024 (n=93)

Variable	Category	Frequen cy (f)	Percenta ge (%)
----------	----------	-------------------	--------------------

History	Hypertensi on	56	60,2
Hypertensi on	No	37	39,8
History	Asthma	67	72,2
Asthma	No	30	22,8

Source: Data Processing Results, 2024

Table 1 shows the results for the 93 participants who had spinal anesthesia for elective cesarean sections at Sriwijaya Hospital Palembang, it is known that most of them have an average history of hypertension, namely 56 people (60.2%), have an average history of asthma, namely 67 people (72%).

Univariate Analysis

Table 1. Summary of Systolic Blood Pressure of Respondents in 2024 at Sriwijaya Hospital Palembang who Underwent sectional cesarean Surgery with Spinal Anesthesia (n = 93).

Systolic Blood Pressure	Frequency (f)	Percentage (%)
Hypotension (< 90 mmHg)	45	48,38
Normal (90-119 mmHg)	30	32,26
Prehypertension (120-139 mmHg)	18	19,36
Total	93	100

Source: Data Processing Results, 2024

The results shown in table 2 reveal that out of the 93 participants who had spinal anesthesia for caesarean sections, most of them, 45 people (48.38%) of them had an average systolic blood pressure that was in the hypotensive category (< 90mmHg). Prevention that can be done is the administration of intravenous fluids, oxygen, injecting ephedrine precursor drugs to elevate the limbs.

Table 2. Summary of Participants' Diastolic Blood Pressure Readings from 2024 at Sriwijaya Hospital Palembang for

Caesarean section Surgery Under Spinal Anesthesia (n = 93).

Diastolic Blood Pressure	Frequency (f)	Percentage (%)
Hypotension (< 60 mmHg)	43	46,2
Normal (60-79 mmHg)	35	37,6
Prehypertension (80-89 mmHg)	15	16,2
Total	93	100

Source: Data Processing Results, 2024

Table 3 shows that out of 93 participants who received spinal anesthesia for a cesarean section, 46.2% had an average diastolic blood pressure below 60 mmHg, with 43 individuals falling into this group. This occurred because the respondent's posture during the cesarean section put a strain on the Vena cava. Therefore, nurses have an additional option to consider when administering the left tilting position to decrease hypotension after a cesarean operation with a spinal anesthetic.

Table 4. Overview of Pulse in Patients with Sectio Caesarea Surgery with Spinal Anesthesia at Sriwijaya Hospital Palembang in 2024 (n=110).

Pulse Rate	Frequency (f)	Percentage (%)
Bradycardia < 60 x	8	8,6
Normal 60-100 x	33	35,5
Tachycardia > 100x	52	55,9
Total	93	100

Source: Data Processing Results, 2024

The results shown in table 4 reveal that out of the 93 participants who had spinal anesthesia for caesarean sections, most of them 52 people (55.9%) had an average pulse rate in the tachycardia category.

Due to the falling tension, the heart beats fast to fulfill sufficient volume/maintain blood pressure.

Table 5. Overview of MAP in Patients with Sectio Caesarea Surgery With Spinal Anesthesia at Sriwijaya Hospital Palembang Year 2024 (n=93).

MAP	Frequency (f)	Percentage (%)
Normal	80	86,02
Normal high	13	13,98
Total	93	100

Source: Data Processing Results, 2024

According to the data in table 5, the majority of the 93 participants who received spinal anesthesia for caesarean sections had normal MAP values, with 80 out of 93 (86.02%) falling into this group.

Discussions

The findings revealed that out of the 93 participants who had sectional caesarean surgery with spinal anesthesia, 56 (60.2%) had a preexisting hypertension diagnosis, whereas 37 (30.8%) did not. The most common side effects of spinal anesthesia include low blood pressure and slow heart rate, which are more common in those who had hypertension in the past. These consequences may be addressed by regularly using antihypertensive medications.

Among the 93 participants who received spinal anesthesia for caesarean sections, 67 (or 72%) had a preexisting asthma diagnosis, whereas 30 (or 28%) did not. Inflammation and constriction of the airways cause reversible airway obstruction in asthma, a chronic lung disease. The choice of anesthesia for SC depends on the urgency of the SC and the patient's asthmatic respiratory status. Spinal anesthesia has the advantage for patients with asthma as there is no need for intubation which will affect the airway and may decrease the incidence of bronchospasm due to airway manipulation. However, in patients with uncontrolled

asthma, spinal anesthesia may be detrimental as it may affect ventilatory capacity if a high motor block occurs.

The findings showed that out of the 93 eligible participants who had spinal anesthesia for sectional cesarean surgery, 45 people (48.38%) of them had systolic blood pressure in the hypotensive category, 30 people (32.26%) had systolic blood pressure in the normal category, and 18 people (19.36%) had systolic blood pressure in the prehypertensive category. This happens because a decrease in blood pressure after spinal anesthesia is considered a physiological response, but in some cases, a severe decrease in blood pressure can be considered a complication and requires management based on the patient's clinical condition. The next causative factor can be due to bleeding or lack of fluid, the larger the incision during surgery the more water evaporates, the loss of fluid causes blood plasma to decrease. Decreased blood pressure after surgery is also due to a slowed heart rate [23,24].

These findings corroborate those of Poi (2017), who studied the effects of spinal anesthesia on the profile of blood pressure decrease (hypotension) in patients undergoing caesarean sections. The results showed that the highest percentage decrease in systolic blood pressure after spinal anesthesia was 18.18% while for diastolic blood pressure the highest reached 11.11%.

Management that can be done to reduce and also prevent hypotension after spinal anesthesia, in particular, having the uterus tilted to the left and being prehydrated with colloids or crystalloids. The trendelenberg posture may be used to overcome hypotension, fluid administration via intravenous catheters, oxygen therapy, and the administration of vasopressor drugs. Giving small doses of local anesthetics with the addition of intrathecal opioids can increase analgesic potential

without increasing the level of sympathetic blockade so that the incidence of hypotension can be reduced.

The findings showed that out of 93 participants who had spinal anesthesia for a caesarean section, an average of 52 individuals (55.9%) had a pulse rate in the tachycardia category, 33 individuals (35.5%) had a normal pulse rate, and 8 individuals (8.6%) had a pulse rate classified as bradycardia. Tachycardia occurs as a compensatory response to decreased tension, causing the heart to beat faster in order to maintain adequate blood volume and blood pressure. These results are in agreement with those of Pradipto Utomo, who found that when patients are under spinal anesthesia, their pulse rates tend to follow a pattern in which stimuli that raise the heart rate also raise the blood pressure, while stimuli that reduce the heart rate do the opposite. In some cases, however, such as when atrial fibrillation receptor activation causes hypotension and tachycardia, the rule does not apply (12).

In general, with age, arteries become stiffer and pulse waves move faster. Typically, Blood pressure is raised in response to stimuli that raise the heart rate and lowered in response to stimuli that reduce the heart rate. But there are cases when this isn't the case, such as when atrial fibrillation receptor activation causes hypotension and tachycardia. Both parasympathetic and sympathetic fibers innervate the SA and AV nodes, which impact the speed and frequency of impulse conduction, and the autonomic nervous system is primarily responsible for the extrinsic control of cardiac frequency. Stimulation of parasympathetic fibers will reduce heart rate frequency, while sympathetic stimulation will accelerate heart rate (Medika & Pramono, 2011).

Results showed that out of 93 participants who had spinal anesthesia for cesarean section surgery, 93 people

(86.02%) had an average MAP value in the normal category, and 13 people (13.98%) of them had MAP values in the high normal category. This occurs because systolic and diastolic pressures do not always increase or decrease at the same time; when the systolic pressure rises, the diastolic pressure may remain normal, or vice versa. As a result, the MAP value can still be considered normal. However, for respondents with elevated MAP values, this is attributed to a pre-existing history of hypertension. The decrease in Mean Arterial Pressure (MAP) after induction with propofol theoretically occurs due to a decrease in smooth muscle tone in the blood vessels and a decrease in systemic vascular resistance and suppression of sympathetic nerve activity so that there is a significant decrease in MAP after induction with propofol. This decrease in MAP in the use of propofol alone without coinduction agents can reach between 20-25%, where a decrease in MAP above 20% at the time of induction is said to be an unstable hemodynamic condition. In another study conducted. While in getting different results from this study on diastolic blood pressure on propofol fentanyl induction also showed changes of > 10% and changes in mean arterial pressure of > 10% obtained after induction.

However, there are differences in research conducted by Uzul (2011), propofol induction in healthy adults is about 1.5 to 2.5 mg/kg b.i.v. This will produce blood levels around 1.5 to 2.5 mg/kg b.i.v.. This will result in blood concentrations of approximately 2-6 µg/ml, which can lead to unconsciousness in the patient. Nevertheless, the age of the patient and the presence or absence of other drugs also influence the necessary propofol dosage. In the absence of fentanyl, the average reduction in systolic blood pressure after the injection of 2 mg/kg b.w. of propofol was around 28 mmHg, as reported

by Billard et al. (2012). The systolic blood pressure will drop by about 50 mmHg or 53 mmHg when 2 ° g/kg bb or 4 ° g/kg bb are coupled with fentanyl.

Limitations Research

Following the research, the researcher encountered challenges in the field that led to several limitations in this study. Specifically, this study only examined the history of hypertension and asthma. It is recommended that future researchers who wish to investigate hemodynamic changes in cesarean section patients with spinal anesthesia consider including additional variables or factors not covered in this study, to offer a fuller account of the outcomes.

Conclusion

The majority of individuals undergoing spinal anesthesia for cesarean delivery at Sriwijaya Hospital Palembang had a history of hypertension and asthma. A significant proportion of participants experienced hypotensive systolic and diastolic blood pressure, with values lower than normal. Furthermore, most participants displayed tachycardia, while a smaller group had a normal pulse rate or bradycardia. Regarding mean arterial pressure (MAP), the majority exhibited normal levels, with a smaller subset showing MAP values in the high-normal range.

Funding Information

None

Conflict of Interest Statement

The authors have confirmed that they have no competing interests.

Data Availability

The datasets used or generated in this study are available from the corresponding author upon reasonable request.

Author Contributions

Fredy Marta: Conception and design of the study, Search Data Base, Methodology, Analysis Risk of Bias, Data Analysis and Interpretation, Writing, Review and Editing. **Danang Tri Yudono:** Study conception and design, search database, methodology, data analysis and interpretation, and writing, review, and editing. **Septian Mixrova Sebayang:** Conception and design of the study, Search Database, Methodology, Data Analysis, and Interpretation, Writing, Review, and Editing. **Made Suandika:** Conception and design of the study, Search Database, Methodology, Data Analysis and Interpretation, Writing, Review, and Editing.

References

1. Fitriarningsih, Rumantika, Burhan A. Efek Hypotermia Pasca General Anestesi: A Scoping Review. *Viva Med J Kesehat Kebidanan Dan Keperawatan*. 2021;11.
2. Baroki Saragih Mn, Lintang Suryani R, Burhan A. Overview Of Spinal Anesthesia Injection Techniques At Rsi Fatimah Cikacap: English. *Java Nurs J*. 2023 Oct 16;1(2):97–102.
3. Fajrini F. Analisis Hubungan Antara Pengetahuan, Psikologi Dan Pengalaman Bersalin Ibu Dengan Pemilihan Proses Persalinan Normal Atau Caesarea Pada Pasien Melahirkan Di Rsia Hermina Ciputat. *J Kedokt Dan Kesehat*. 2016;12(2):121–8.
4. Ramdan T, Siwi As, Ulfah M. Gambaran Hemodinamik Pasien Intra Operasi Sectio Caesarea Dengan Spinal Anestesi Di Rumah Sakit Umum Daerah Pasar Rebo Jakarta Timur. 2022 Semin Nas Penelit Dan Pengabd Kpd Masy Snpkm. 2022;528–37.

5. Sulistianingsih Ar, Bantas K. Peluang Menggunakan Metode Sesar Pada Persalinan Di Indonesia (Analisis Data Sdki Tahun 2017). *J Kesehat Reproduksi*. 2018;9(2):125–33.
6. Helmi N, Rasyid Z. Determinan Persalinan Sectio Caesarea Pada Ibu Bersalin Di Rumah Sakit X Pekanbaru Tahun 2019. *J Kesehat Komunitas*. 2020;6(1):115–21.
7. Kristiani M, Utami Nw, Susmini. Faktor-Faktor Yang Berhubungan Dengan Pengambilan Keputusan Persalinan Sc Pada Ibu Di Rsia Melati Husada Malang. *Nurs News (Meriden)*. 2019;2(3):386–97.
8. Nurdiansyah P, Susanto A, Burhan A, Suandika M, Wijayanti I. Overview Of The Incidence Of Post Operative Nausea And Vomiting In Spinal Anesthesia For Sectio Caesarea Patients In The Recovery Room Of Fatimah Cilacap Islamic Hospital. *Java Nurs J*. 2024 Feb 1;2(1):50–6.
9. Susanti I, Mixrova Sebayang S, Burhan A. Impact Of Ondancetron In Intra-Anesthesia During Caesarean Section: A Meta-Analysis Of Randomized Trials. *Java Nurs J*. 2024 Feb 1;2(1):26–42.
10. Alverina F, Suryani Rl, Burhan A. An Overview Caring Behavior Of Anesthesiologist In Spinal Anesthesia Patients At Rsud Cilacap. *Java Nurs J*. 2024 Jun 21;2(2):124–30.
11. Vika Andriyani, Roro Lintang Suryani, Asmat Burhan. The Relationship Of Family Support With The Level Of Pre-Anesthesian Sectio Patients In The Hospital Pekalongan Regional General. *Java Nurs J*. 2024 Feb 1;2(1):43–9.
12. Triyadi F, Mixrova Sebayang S, Burhan A, Dwi Agus Yulianto, Refa Teja Muti. The Relationship Between Age And Duration Of Surgery With The Incidence Of Post Anesthesia Shivering In Section Caesarean Patients At Bendan Hospital Pekalongan City. *Java Nurs J*. 2024 Feb 1;2(1):7–14.
13. Tanambel P, Kumaat L, Lalenoh D. Profil Penurunan Tekanan Darah (Hipotensi) Pada Pasien Sectio Caesarea Yang Diberikan Anestesi Spinal Dengan Menggunakan Bupivakain. *E-Clin*. 2017;
14. Arif Sk, Wahab A, Tofani Rm. Manajemen Anestesia Pada Kehamilan Dengan Sindrom Eisenmenger Anesthesia Management Of Pregnancy With Eisenmenger Syndrome. *J Anesthesiol Indones*. 2019;9(1):19–30.
15. Fauzan Dh, Sebayang Sm, Burhan A, Suhendro. Gambaran Kejadian Shivering Post Spinal Anestesi Pada Pasien Benign Prostatic Hyperplasia Di Rumah Sakit Umum Daerah Cilacap. 2024 May 10 [Cited 2024 Aug 22]; Available From: <https://zenodo.org/doi/10.5281/zenodo.11173343>
16. Angin Sep, Novitasari D, Burhan A. Volume 6 Number 1, Februari 2024 E-Issn 2715-1972; P-Issn 2714-9749 [Http://jurnal.globalhealthsciencegroup.com/index.php/ijghr](http://jurnal.globalhealthsciencegroup.com/index.php/ijghr). 2024;6(1).
17. Gebrargs L, Gebremeskel B, Aberra B, Hika A, Yimer Y, Weldeyohannes M, Et Al. Comparison Of Hemodynamic Response Following Spinal Anesthesia Between Controlled Hypertensive And Normotensive Patients Undergoing Surgery Below The Umbilicus: An Observational Prospective Cohort

- Study. Anesthesiol Res Pract. 2021;2021. <https://zenodo.org/doi/10.5281/zenodo.11313844>
18. Permata Pp, Burhan A, Handayani Rn. Pengaruh Pemberian Aromaterapi Peppermint Terhadap Post Operative Nausea And Vomiting (Ponv) Post Operasi Spinal Anestesi Di Rsud 45 Kuningan. J Inov Glob. 2024 Oct 27;2(10):1517–34.
 19. Ayu Kartika Sari V, Suandika M, Burhan A, Tri Yudono D. Overview Of Induction Drug Dosage Types With The Eracs (Enhanced Recovery After Caesarean Surgery) Sectio Caesarean Method In Post Sectio Caesarean Patients At Hermina General. Java Nurs J. 2024 Jun 21;2(2):110–5.
 20. Asdarina N, Salam Sh, Tanra H. Efek Blok Transversus Abdominis Plane Teknik Landmark Terhadap Kebutuhan Analgetik Pascabedah Herniorafi. Jai J Anesthesiol Indones. 2015;7(2):89.
 21. Sirait Rh, Yuda B. Profil Hemodinamik Pasien Yang Menjalani Seksio Sesarea Dengan Anestesi Spinal Pada Primipara Dan Multipara Di Rsu Uki Periode Tahun 2015-2017. Bunga Rampai Santifika. 2021;2013–5.
 22. Latupeirissa Ken, Angkejaya Ow. Perbandingan Kestabilan Hemodinamika Antara Posisi Left Lateral 15° Dengan Berbaring Terlentang Pada Pasien Sectio Caesarea Post Anestesi Spinal. Pameri Pattimura Med Rev. 2020;2(1):71–81.
 23. Yanrin Asnp, Burhan A, Sukmaningtyas W, Adriani P. Gambaran Kejadian Hipotermi Pada Pasien Sectio Caesarea Di Rumah Sakit Umum Daerah Brebes. 2024 May 26 [Cited 2024 Aug 22]; Available From:
 24. Afrilya To, Sukmaningtyas W, Burhan A. Overview Of Post-Operative Nausea And Vomiting (Ponv) In Patients Undergoing Caesarean Section With Spinal Anesthesia At Fatimah Islamic Hospital Cilacap. 2023;16.